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To the Market Advisory Committee

Commentary on "Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California," June 1, 2007 draft report

Overview

Following are my comments on the Committee's draft report, which I am submitting in advance of the June 12 meeting. These are the key points of my comments:

- There is significant potential for emission reduction in the transportation sector, which neither the existing vehicle GHG standards nor cap-and-trade can fully exploit. Moreover, inclusion of Transportation in the cap-and-trade system may conflict with alternative regulations that could more effectively exploit this potential.

- The policy incompatibility between maximal cost reduction and maximal emissions reduction should be clearly recognized.

- In view of the AB 32 maximum feasibility requirement, attainment of the emission cap in 2020 is a minimal requirement – not a sufficient requirement – for compliance with the statute. To the extent that emission reductions below the cap are demonstrably feasible and cost-effective, they are required (not just by statute, but also by imperatives of climate change), and policy instruments should be constructed to achieve such reductions.

- The discussion of cap-and-trade in relation to carbon taxes reinforces the misconception that such taxes are the only viable regulatory alternative to cap-and-trade, and does not recognize that tax instruments can be adapted to achieve the exact same distributional characteristics as cap-and-trade (with or without free allocation).

- It is not evident that a 100%-auctioned cap-and-trade (the recommended option) would have any practical advantage over a straightforward carbon tax.

Transportation policy

In the Introduction (page 2) it is stated that "California's vehicle standards require a 30 percent reduction in GHG emissions from new vehicles by 2016." This statement is a slight exaggeration of what the standards will achieve, and it glosses over the significance of transportation-sector emissions in relation to AB 32. The 30% reduction figure applies to per-vehicle emissions, and represents the projected improvement relative to 2002 baseline performance, not relative to business-as-usual.[1] CARB's projection of aggregate annual emission reductions to be achieved by AB 1493 in 2020 is 30 MMT relative to business-as-usual (an 18% reduction)[2], but the business-as-usual projection does not reflect efficiency improvements that would occur without AB 1493.[3] (In developing the AB 1493 regulations, CARB did not estimate the latter improvements, but did indicate that an improvement between 2.6% and 9.0% would be expected between 2002 and 2009.[4])

From the standpoint of the AB 32 requirements, what is most relevant is aggregate emissions (not per-vehicle emissions) relative to a 1990 baseline (not relative to business-as-usual or 2002). CARB's business-as-usual baseline for 2020 (the reference level for the 30 MMT reduction) is about 37 MMT above the 2004 level, and roughly 60 MMT above the 1990 level[5]; so even with the new emission standard, aggregate light-duty transportation emissions would be about 30 MMT above their 1990 level in 2020, necessitating disproportionately greater emission reductions from other GHG sources to achieve the 2020 emission cap. Thus it is important to consider whether, and how, further emission reductions in transportation could be achieved under AB 32.

In Section 4.2.5 ("Options for Program Scope"), under the heading "Should the Transport Sector Be Included in the Cap-and-Trade Program?" (pages 34-35), the Committee report states that a cap-and-trade program would not be redundant with California's motor vehicle GHG standards because the former constrains aggregate statewide emissions while the latter only regulates vehicle emission intensity. But it is possible that the AB 32 regulations could make the AB 1493 regulations superfluous because the maximum feasibility criterion of AB 32 is less limiting than that of AB 1493 (e.g., the latter effectively prohibits consideration of environmental benefits in quantifying "cost effectiveness"), and moreover, the AB 32 emission reduction goals are much more ambitious. If the economic incentives created by AB 32 are alone sufficient to achieve the AB

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[1] Aug., 2004 ISOR (http://www.arb.ca.gov/regact/grnhsgas/grnhsgas.htm , http://www.arb.ca.gov/regact/grnhsgas/isor.pdf), Table 6.2-2

[2] Sept., 2004 ISOR Addendum (http://www.arb.ca.gov/regact/grnhsgas/addendum.pdf), Table 8.2-1 (Emissions in 2020 are reduced by 87,700 ton-CO2/day from a baseline of 497,400 ton-CO2/day.)

[3] ISOR Technical Support Document, Climate Change Emissions Inventory (http://www.arb.ca.gov/cc/factsheets/support_ccemissions.pdf), Table 3

[4] ISOR, p. 63

[5] The ISOR (page 143) states the 2004 baseline as 386,600 ton-CO2/day, and the 2020 baseline as 497,400 ton-CO2/day. The 60 MMT figure is an estimate based on 1.5% annual growth.

1493 standards (as would be the case, for example, if the emission price under the cap-and-trade program exceeded the marginal compliance cost for AB 1493), then emission prices under the AB 4193 tradable performance standard would collapse and the standard would become irrelevant.

The report notes, however, that "… emission reductions from the transportation sector as a result of the cap-and-trade program are likely to be small … For every $10 increment in the per-ton-CO2-equivalent price of allowances, the effect on gas prices would be 8.8 cents per gallon" (page 35). To put these figures in perspective, CARB based the AB 1493 regulations on the criterion that regulatory technology costs should be fully offset by fuel savings, assuming a fuel price of $1.74/gal.[6] The savings are accrued over the 16-year typical vehicle lifetime, and assuming a 5% real discount rate[7], the present value of the fuel savings is $1.18/gal. This represents an upper limit on allowable marginal technology costs under AB 1493; and based on a typical vehicle lifetime VMT of 200,000 miles[8] and fuel emission intensity of 8900 gm CO2 per gallon, the $1.18/gal price corresponds to a technology cost limit of $26 per gm/mi, or equivalently, $132/tonne[9]. Estimated average compliance costs for AB 1493 are substantially lower than this limit – $10.61 and $12.25 per gm/mi for the small- and large-vehicle LEV categories, respectively[10] (equivalently, $0.47/gal or $53/tonne for small vehicles, and $0.55/gal or $61/tonne for large vehicles). These compliance costs differ from the $1.18/gal limit partly because marginal costs for the most expensive compliance technologies are generally higher than average costs, and because there is limited availability of cost-effective compliance technologies. (In setting the standard, CARB only considered commercially proven, incremental technologies to be "cost-effective". For example, gas-electric hybrids were considered to be "infeasible" during the time frame of the regulation[11], and CARB estimated that even at a fuel price as high as $2.30/gal there would be no available cost-effective technologies that would justify a more stringent standard.[12])

In view of recent trends in fuel prices, cost-effective emission prices in the transportation sector could be much higher than the anticipated market prices under a cap-and-trade program. For example, the current (Jan-May 2007 average) price for regular gasoline in California is about $3.00/gal[13], at which rate the fuel cost associated with each tonne of transportation emissions is $337. Based on CARB's assumed 5% discount rate amortized over 16 years, a

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[6] ISOR, page xi
[7] ISOR, page 153
[8] Estimation of Average Lifetime Vehicle Miles of Travel, http://www.arb.ca.gov/regact/grnhsgas/vmt.pdf
[9] "Tonne" means metric ton.
[10] Projected emission rates in 2016 are stated in the ISOR, Tables 6.2-1; baseline rates are inferred from Table 6.2-2; and costs associated with emission reduction are stated in the ISOR Addendum, Table 6.2-7.
[11] ISOR, pages 56, 62 Hybrids are relegated to the "long-term" category, outside the scope of feasibility for the current regulation (page 106).
[12] ISOR, page 197
[13] CEC, http://www.energy.ca.gov/gasoline/index.html

marginal cost of $228/tonne (i.e., $2.03/gal) for improving fuel economy would be justifiable based on fuel savings alone, giving no consideration to environmental benefits or energy security risks. This clearly indicates that there is significant potential for further emission reductions in the transportation sector, which neither AB 1493 nor the proposed AB 32 cap-and-trade system is able to fully exploit.

The Committee report acknowledges that inclusion of the transportation sector in the cap-and-trade system will have little impact on transportation emissions, but argues in favor of such inclusion anyway, on the grounds that “including the transportation sector is critical to providing a consistent price signal across all sectors to promote economy-wide reductions in GHG emissions” (page 35), but in the context of Transportation “consistent” could be read as “consistently low”. Moreover, the cap-and-trade program may conflict with other regulatory approaches for transportation that have the potential of achieving much greater emission reductions. Alternative policies that are complementary to cap-and-trade could be applied conjunctively, but if price-type instruments are considered then transportation should not be included in the program because price and quantity instruments have conflicting policy objectives.

One policy alternative for transportation would be vehicle feebates, which have a close similarity to emission trading, the primary difference being that the policy mandates emission prices rather than emission limits. For example, a feebate based on a mandated price of $2.03/gal (applied to projected lifecycle fuel consumption) would be equivalent to a $2.03/gal tax in terms of marginal incentives, but the typical (RMS) feebate could be around $0.15/gal. (Some vehicles would incur fees while others receive rebates.) This type of policy instrument would be incompatible with cap-and-trade because regulatory policy cannot simultaneously mandate both emission limits and emission prices, and markets cannot simultaneously minimize emissions and costs.

One other point relating to inclusion of Transportation in the cap-and-trade program should be considered. A primary rationale for comprehensive coverage under cap-and-trade is that this provides opportunities for cost minimization. From this perspective, the inability of cap-and-trade to incentivize significant further emission reductions in Transportation is not a policy defect; it merely indicates that the emission cap can be achieved at less cost by reducing emissions in other sectors and that it is less expensive for the transport sector to fund those emission reductions (via emission trading) than to reduce its own emissions. However, cost minimization is not a primary statutory requirement of AB 32; the legislation rather favors maximum feasibility over cost minimization. This is not a legislative oversight – there is a good policy rationale for prioritizing maximum feasibility over cost minimization.

Cost minimization would be an appropriate legislative policy objective if the emission cap for 2020 represented a long-term target consistent with

sustainability objectives. However, in view of the much greater emission reductions that will be required (e.g. 80% reduction from 1990 by 2050), a compliance strategy that achieves minimum short-term costs, based on the 2020 cap, would not necessarily represent a least-cost strategy in relation to more stringent post-2020 caps. For example, a company building a power plant or automobile manufacturing facility may find that purchasing emission credits is less expensive than investing in state-of-the-art GHG mitigation technology; but if that facility has to later be prematurely decommissioned or retrofitted to meet more stringent post-2020 regulations, the cost of doing so could be much higher than if the facility had originally been designed to maximum feasible standards.

AB 32 clearly recognizes that the 2020 cap is only an interim goal, which does not in itself achieve climate sustainability requirements. It therefore imposes the 2020 cap as a minimal, interim requirement, but additionally imposes a maximum feasibility requirement (Sec. 38560) and requires continuance of emission reductions (not just maintenance of the cap) beyond 2020 (Sec. 38551). In view of the AB 32 statutory requirements and their underlying legislative policy rationale, a regulatory strategy of market segmentation may be more appropriate than one of comprehensive coverage because different standards of maximum feasibility, and correspondingly different emission prices, may apply to different market sectors.

Guiding Design Principles

The “Guiding Design Principles Affirmed by the Market Advisory Committee” (page 11) states that “A cap-and-trade program to limit California GHG emissions should be designed to achieve the maximum feasible cost-effective reductions …”. This statement of principles is consistent with AB 32 but conflicts with the earlier-stated cost-minimization objective of cap-and-trade (e.g., in Section 2.1, page 6). The policy incompatibility between maximal cost reduction and maximal emissions reduction should be clearly recognized.

The AB 32 regulations can be constructed to either (1) achieve the mandated emission cap at minimum cost irrespective of whether further emission reductions would be technologically feasible and cost-effective, or (2) achieve the maximum technologically feasible and cost-effective reduction of greenhouse gas emissions irrespective of whether the mandated cap could be achieved at less cost. Which alternative represents the policy objective of cap-and-trade, and which approach is required by AB 32?

AB 32 statutory requirements

In Section 1.2.1 (pages 3-4) the Committee report states, in reference to AB 32, that “…this legislation set[s] an enforceable target of reducing the state’s GHG

emissions to 1990 levels by 2020." Section 4.1.1 (page 21) further asserts the following: "The Global Warming Solutions Act calls for reducing California's GHG emissions to 1990 levels by the year 2020. To meet the 2020 target, the sum of emissions allowed under the cap-and-trade program, plus expected emissions from sources not included under the program's cap, must be equal to 1990 emissions levels."

These statements misconstrue the precise statutory requirements of AB 32. Nowhere in the legislation is the 1990 emission level referred to as a "target", and nowhere is it stated that emissions in 2020 must be equal to 1990 emission levels. The cap is rather referred to as a "limit", specifically, "the maximum allowable level of statewide greenhouse gas emissions in 2020" (Sec. 38505(n)). The legislation also makes reference to a second limit, that defined by feasibility and cost-effectiveness constraints, below which further emission reductions are not required. Although the term "target" does not appear in AB 32, the statute makes it clear that the lower limit – that determined by feasibility and cost-effectiveness, and not the cap – is the target. This is the evident intent of Sec. 38560, which states:

> The state board shall adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from sources or categories of sources, subject to the criteria and schedules set forth in this part.

This language imposes a cost-effectiveness requirement, and within this constraint the stated statutory requirement is to achieve maximum emission reductions, not maximum cost reductions. Sec. 38560.5(c) further states,

> The regulations adopted by the state board pursuant to this section shall achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from those sources or categories of sources, in furtherance of achieving the statewide greenhouse gas emissions limit.

The qualifier "in furtherance of achieving the statewide greenhouse gas emissions limit" means in furtherance of achieving an emission level not exceeding the maximum allowable level in 2020; it does not mean achieving emissions equal to the 2020 limit. Considering that the AB 32 regulations will not cover all statewide emissions, and that emissions outside the regulated sectors cannot be predicted with certainty, a policy that is targeted on maximum feasibility rather than the cap limit will be more likely to achieve the cap and will additionally create momentum for necessary post-2020 reductions.

In view of the maximum feasibility requirement of Sec. 38560, attainment of the mandated cap in 2020 is only a minimal requirement – not a sufficient requirement – for compliance with AB 32. To the extent that emission reductions

below the cap are demonstrably feasible and cost-effective, they are required. If this was not the legislative intent there would be no need for the maximum feasibility requirement, and the legislation could have only required CARB to implement regulations sufficient to achieve the cap, and to do so at minimum cost.

The statute makes reference to cost minimization in Sec. 38501(h) and in Sec. 38562(b): "… the state board shall … (1) Design the regulations … in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California …". In the context of the maximum feasibility requirement, the cost minimization condition can be interpreted as an economic efficiency requirement, i.e., the emission reductions should be achieved in such a manner that the same reduction level could not be achieved at less cost or with greater benefit to the economy. It does not imply that greater emission reductions should not be achieved (albeit at greater cost), if such further reductions would be feasible and cost effective according to Sec. 38560.

Rationale for Cap-and-Trade

Section 2.1 (page 6) outlines the advantages of cap-and-trade and briefly discusses carbon taxes. This discussion bypasses some fundamental issues relating to the advantages and disadvantages of both regulatory approaches that policy makers need to understand.

The primary stated attractions of the cap-and-trade approach are stated as "its ability to put a clear and specific limit on aggregate emissions and its potential to achieve the emissions-reduction target at lower cost than would otherwise be possible". The advantages of a carbon tax can be stated conversely as its ability to put a clear and specific limit on marginal costs and its potential to achieve lower emissions than would otherwise be possible. In either case, these advantages are, to an extent, idealizations that must be tempered by practical realities.

The putative "environmental certainty" of cap-and-trade is not very meaningful if the cap is not set at an environmentally sustainable level. The certainty of attaining an environmentally unsustainable emission level is less important than the probability of ultimately achieving a sustainable level. It is less important because environmental certainty can only be achieved by compromising environmental effectiveness, i.e., the only way to guarantee compliance with an emission cap, while also ensuring cost acceptability, is to set the cap so far above the sustainable level that cost acceptability is assured under the most cost-conservative predictive assumptions. (The AB 32 emission cap is presumably premised on such cost conservatism to ensure that it will be feasible and cost-effective.)

Regarding the cost-minimization function of cap-and-trade, there is no guarantee that “minimum cost” implies “acceptable cost”, so unless caps are enforced without regard to cost there is no guarantee that the cap will be achieved. (It should be noted that AB 32 does not guarantee attainment of the cap. Either the legislature (Sec. 38551(a)) or the Governor (Sec. 38599(a)) may intervene to suspend the cap; thus there is a built-in political “safety valve” that would be invoked to ensure that costs do not exceed limits of political acceptability.)

Carbon taxes have features that could, in principle, overcome the limitations of cap-and-trade. The mandated tax rate effectively constitutes a cap on marginal costs (because a regulated firm will not spend more than one dollar on emission reduction to achieve a one dollar reduction in its tax); so to the extent that “cost effectiveness” is quantified in terms of a dollar-per-ton marginal cost limit, a tax could (in principle) be instrumental in implementing the AB 32 mandate requiring “maximum technologically feasible and cost-effective greenhouse gas emission reductions”. Since the tax rate is directly mandated, it need not be biased to accommodate predictive uncertainty, as emission caps must be, so the tax rate could be set at a level higher than the expected emission price under cap-and-trade. To the extent that regulated firms respond equally to marginal incentives with either policy, the higher tax rate would result in greater emission reductions; and the price stability and predictability of a tax would further encourage sustained, long-term investment in low-emission technologies.

The above advantages notwithstanding, there is one crucial aspect of taxes that limits their political and economic viability: If the tax rate under a carbon tax were set to match the emission price under a market trading system, then the marginal incentives would be the same but the total costs to regulated firms under the tax system would be vastly greater (e.g., by an order of magnitude). Under a cap-and-trade system, a regulated firm only pays for emission allowances in excess of its initial quota (which is typically freely allocated), and firms that do not need their entire allocated quota can sell what they don’t need at a profit. By contrast, carbon taxes are typically applied to a firm’s entire emissions output; so all taxed firms, including the most efficient as well as the least efficient, incur a tax burden (in addition to the cost of emission reduction) that can only be avoided by reducing emissions to zero. CARB would consider total costs and distributional impacts of regulatory policy, not just marginal costs, in assessing the “cost effectiveness” of policy alternatives for AB 32, and on this basis would probably reject carbon taxes.

Carbon taxes’ advantages of price stability, economic efficiency, and low transaction costs have been insufficient to overcome their cost disadvantage and to achieve political viability. This could explain why almost all of the major climate-related legislative and regulatory policy initiatives in the U.S. (including the activities of the Market Advisory Committee) are focused on cap-and-trade and not taxes. But there is a crucially important principle of environmental taxation that policy makers (and their market advisors) need to understand:

Carbon taxes are not inherently more costly than emission trading; in fact they can be implemented to match the distributional characteristics of cap-and-trade by distributing tax revenue in exactly the same way that emission allowances are distributed. For example, if output-based allocation is employed in the utility power sector, then under a carbon tax the revenue would be similarly refunded to regulated entities in proportion to power output. If some portion of the allowances is auctioned, the same portion of tax revenue would be used in the same way as auction revenue. To the extent that regulated firms respond equally to marginal incentives from refunded taxes or emission trading, a carbon tax and a cap-and-trade system using the same allocation method would be equivalent in the following sense: If the tax rate is the same as what the emission price would be under the trading system, then a firm's losses and gains from taxes and refunds would be no different from its losses and gains from emission trading under cap-and-trade, and its response to the regulatory incentive and resulting emission performance would be the same in either case. (The Swedish regulatory system for stationary-source NOx emissions provides a good working example of how a refunded-tax system operates.)

With the option of tax refunding, the only fundamental tradeoff consideration between carbon taxes and cap-and-trade is whether it is better to cap emissions and incentivize the market to reduce costs, or to cap marginal costs and incentivize the market to reduce emissions. Many of the same program design issues and considerations apply in either case; and although the Committee report is focused on cap-and-trade, much of the report would be equally applicable to either regulatory approach. All of the discussion pertaining to upstream-versus-downstream regulation, leakage, monitoring, and allocation, would be applicable to any such regulatory system. In particular, any allocation method that is applicable to cap-and-trade could be similarly applied to tax policy; and any good policy rationale for or against free allocation would be an equally good argument for or against tax refunding. The allocation method can be determined independently of whether a price or quantity instrument is chosen, and tradeoff comparisons between price and quantity instruments should be premised on the same allocation method to avoid confusing the generic characteristics of such instruments with characteristics of the distributional methodology.

Allowance Distribution

In Section 6.1 (page 52), the report makes the unsubstantiated and untenable assertion that allowance distribution "will not have an impact on the environmental result of the cap-and-trade program." CARB has not yet committed to a standard of "cost-effectiveness" for implementing AB 32, but to the extent that cost-effectiveness equates to "political acceptability" the distributional impacts of policy options will surely affect the choice and stringency of policy instruments. The notion that allowance distribution is immaterial to

environmental results appears to be based on academic idealizations that have no empirical basis. Is there any evidence, for example, that the U.S. SO2 program would have been politically viable, or of equal stringency, if allowances had not been freely allocated? Considering California's vehicle GHG standards, auctioning of tradable allowances was never an option because the sale of allowances would have been tantamount to "fees and taxes", which were prohibited by statute. The prohibition had to be incorporated in the legislation to secure political support after the AB 1493 predecessor, AB 1058, was unable overcome political opposition.

The Committee advocates "a system in which California ultimately auctions all of its emissions allowances". Such a system would essentially equate to a carbon tax, plus the market volatility and transaction costs of a trading system. What is the advantage of 100%-auctioned cap-and-trade over a straightforward carbon tax; why is it that the word "tax" does not appear anywhere in AB 32; and why is it that the Committee been assigned to focus exclusively on cap-and-trade and not on tax instruments? "Environmental certainty" is clearly not the answer. Environmental certainty requires that the cap be set at a sustainable level (which the AB 32 limit is not), and that the cap be enforced at any cost. "Environmental effectiveness" is an equally implausible answer. Cap-and-trade will be no more effective than a tax at reducing emissions unless the market price for emissions exceeds the tax rate, which can be set to the maximum feasible level by mandate.

The Committee maintains that "Ensuring a specified emissions target is particularly desirable in view of the emissions goal established by the Global Warming Solutions Act" (page 6). But ensuring a specific marginal cost target would be more desirable in view of the more stringent mandate requiring "the maximum technologically feasible and cost-effective greenhouse gas emission reductions"; thus a tax would be more responsive to the legislative mandate.

The Committee argues against free allocation on the grounds that it creates windfall profits, but windfall profits are entirely consistent with a "market-based" regulatory approach. In accordance with the precepts of Adam Smith, scarcity of emission-intense energy creates windfall profits; this attracts investment capital to low-carbon energy, which in turn brings the overall supply of energy back into balance with demand, lowers prices, and facilitates economies of scale and mass commercialization of low-carbon energy. The problem with free allocation is not that it is free, but rather that grandfathering does not allocate allowances to the most efficient energy producers. An alternative approach would be output-based allocation. If all energy sources, including renewables, are included in the allocation, the windfall profits would go to the least emission-intense producers, who can reinvest their windfall profits to expand production (within the limits of the emission cap) to meet demand. A significant shortcoming of the Committee report is that it makes no mention of output-based allocation, which would have many of the benefits attributed to auctioning.

The Committee argues that “auction revenues can be used more directly and more transparently to advance program goals” (page 54). In the spirit of a market-based approach, would it not make sense to use auction revenue to take allowances off the market? Is the government more efficient than the market at finding least-cost emission reductions? (If so, there would be no need for emission trading.)

Banking

It is stated in Section 6.4.1 (page 62) that “intertemporal trading of allowances can be a very useful feature for managing price volatility and limiting allowance costs”. If price stability and cost control are policy objectives, then why use cap-and-trade? A tax would be more effective at achieving these objectives. Moreover, banking can only be used if caps are excessively lenient. How can the Committee’s recommendation favoring “unlimited banking” be reconciled with AB 32’s maximum feasibility requirement and with the long-term goal of reducing emissions to sustainable levels (e.g. 80% reduction by 2050)?